SOLUTION AND ABSORPTION OF MEDICINES,

OR THE

BEST MEANS OF SECURING THE GOOD EFFECTS OF MEDICINES

IN THE

CURE OF DISEASE.

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Mr. President and Members of the Tri-States Medical Association:

With a desire to contribute my small share to the general interest of the Tri-States Medical Society and that of our honorable Profession at large, I decided to offer for your consideration a brief paper.

The subject which I have selected is neither a well-worn nor thread-bare one; and being deeply impressed with the importance of it, I desire to present it in a manner that will benefit the Profession who give medicines and the people who take them. Medicines have always been, and still continue to be, administered to the sick in undigestible forms, greatly to their injury, and an effort to correct that abuse imparts to this paper some claim to originality; indeed, I am not aware that any writer has written upon or discussed this subject in the manner I now propose to do. It will not be considered presumption to hope that in the discussion of this subject, I may be able to strike a key-note in the scale of medical reform, whose tones shall call forth responsive echoes throughout the civilized world, and that thousands of disease-stricken inhabitants of earth may through the influence of this discussion live until the frosts of old age have whitened their heads and ripened their time-worn bodies for the grave, while their souls are fitted for the beautiful hereafter.

While it is commendable that we occasionally soar into new fields of speculation and investigate new scientific discoveries, and experiment with and investigate new theories and new remedies, it is also proper that we occasionally come back to first principles to review and discuss fundamental laws, so that we do not lose sight of the foundation upon which all speculation should be built. When I had some time ago completed some small contributions to the literature of new remedies, I was admonished by one of our leading physicians, who said he "believed it was best that we confine ourselves to the old and well-tried remedies, and not spend much time in the investigation of new ones." I then decided to confine myself to sober facts, and write this paper on the subject of the solution and absorption of medicines and the best means of securing their good effects in the cure of disease. This subject had for me an unusual interest during two courses of lectures that I delivered before medical classes, and afforded me so much food for thought, that, although I was apprehensive that I would not be able to present it fully up to the requirements of a paper to be read before a learned body of physicians, I hope at least the subject will not be entirely uninteresting, but will both interest and benefit the Profession. It will, I am aware, be a difficult task to explain how medicines introduced into the stomach produce

their peculiar effects on the human system in a state of health, or in a condition approximating a healthy state of the digestive and absorbent system; but the difficulty will be greatly increased in attempting to explain their action during a suspension or partial arrest of the functions of secretion, digestion and absorption throughout the manifold phases of disease, interfering with the due performance of these functions. In order to pass through the soft mucous membranes of the stomach and intestines by the process of absorption and endosmosis, and enter the capillaries of the portal system of veins, medicinal substances must first undergo solution in the gastric and intestinal secretions.

If a medicine be introduced at another part of the body, its action will be the same as when placed in the stomach. Morphine will arrest secretion, relieve pain, and produce the usual narcotic effect when administered hypodermically. "Tartar emetic will produce nausea and vomiting when injected into the veins." This goes to prove that medicines must enter the circulation, and not remain in the stomach, if they are to have a medicinal effect, and before a medicinal action can begin they must be conveyed by this process of absorption where they can mingle with the circulating fluids of the body, and be conducted by the blood to the parts of the system upon which they are designed to act. Medicines do not influence such organs as the brain, liver, kidneys or bladder at a distance, but must be carried by the blood directly to them, for medicines which are supposed to exert a specific influence over these and other organs have been detected in them after having been introduced into the stomach; and there is no probable way for them to reach the organs except through the channels of the circulation. When the medicines have once entered the blood, they may, by acting upon it, cure many diseases which depend upon a fault in that fluid. The medicines in this way may supply a deficiency in some of the constituents of the blood, or they may act as an antidote in the blood by destroying or counteracting morbid matters which they may come in contact with.

Astringent medicines by contracting muscular fibre and diminishing the size of the blood vessels may arrest hæmorrhage or check undue secretion. A few medicines may act locally on the mucous membranes of the stomach, and a few, not many, may act through the agency of the nervous system. There can be no question of the fact that medicines, as a rule, do pass out through the stomach by absorption and enter the blood, for they have been detected in the blood, and in the secretions formed from it. In order that they be enabled to pass through the mucous membranes of the stomach and intestines, an important requirement is that they become fluid. Ample provision has been made by nature for their solution in the secretions of the stomach and intestines in a healthy state of these organs. Those medicines which are soluble in acids are dissolved in the gastric juice, as well as those which are soluble in water. Pepsin, which is the principle of digestion in the gastric juice, will dissolve albuminous substances and the like. Substances which are soluble in alkaline fluids and not so in the gastric juice are dissolved by the bile which is poured out into the first part of the intestines, and aided by the pancreatic juice also furnished here. When once dissolved and reduced to a liquid state, we will find that all the requirements for their absorption are at hand; the intestines alone from measurements made by Meckel have a secreting and absorbing surface of 1,400 square inches. This would appear to leave no doubt of the capability of the absorbents to take up

and convey to the circulation a large amount of medicines, provided that they have been dissolved and reduced to a liquid state. This brings me to the practical part of this subject. In nearly all protracted diseases and many acute ones, the solvent and digestive powers become much enfeebled; some of the elements necessary to dissolve these medicinal substances are furnished sparingly or not at all, and some of the medcines, after entering the stomach, are only partly dissolved or left as when swallowed.

I now propose to notice some of the causes which may hinder the solution of medicines in the stomach. Beginning with the saliva, which has an important part to perform in the process of digestion and the solution of medicines. It is well known that this secretion may be arrested by certain forms of disease, and the mouth become dry and clammy, and thereby the saliva is withheld and prevented from performing its office in digestion. In certain diseased conditions of the stomach the gastric juice is not secreted in sufficient quantities, or some of the elements which constitute its solvent powers may be wanting, and it thereby fails to dissolve the medicine, which must pass out of the stomach through the pyloric orifice in a solid state and enter the intestines, or be rejected from the stomach by vomiting. Should it, however, enter the intestine and happen to be of that peculiar quality that requires an alkaline solution to dissolve it, the liver is amenable to the charge of frequent whims of torpidity in which it refuses to furnish the bile, which is alkaline, and the medicine must pass on without being changed from the solid form in which it entered the stomach. If not dissolved it is not absorbed; if not absorbed it never reaches the circulation, and is never conveyed to the organs upon which it was designed to act, nor to the nerve centres, that they through reflex action might perform their peculiar office. The disease is not checked, not even modified, but continues to increase in severity, and the patient dies, though taking medicine to the last hour. The medicine suffers the unjust censure of being worthless in the disease, and the doctor should suffer the just censure of doing bad practice.

There is often much difficulty existing in obtaining the proof of the irreparable damage done by the mistakes made in prescribing medicines in a solid form which are never dissolved; never produce the good office they were intended for, but occasion the loss of valuable time. Astounding as the proposition may at first thought appear, I conscientiously believe that bushels of pills and solid medicinal substances are passing every day of the world through the stomachs and alimentary canals of the sick, and cast off with other refuse of the body, as whole and perfect as they were when swallowed, or so little of them dissolved as to have no appreciable good effect. If the unnumbered dead could arise from their graves and bear testimony as to the cause of their untimely deaths, a large amount of the proof would be that the doctor who was employed to cure them made a fatal mistake in prescribing undigestible medicines, which, owing to the diseased condition of the digestive system, were never dissolved in the stomach, and interposed no barrier to the disease.

Unlike many of the errors in the practice of medicine, this one of giving undigestible medicines does not apply alone to the ignorant members of the Profession, but the educated and scientific practitioners, even teachers of medicine and authors, appear to have quite overlooked this dangerous and fatal error. How many physicians claiming to be rational, even scientific in their practice, would promptly object to their

patients taking for nourishment such articles of diet as ham, cheese, sausage, or hard-boiled eggs and the like? "Oh no, you must not think of permitting them to have such diet; you see they are sick," says the doctor, "and their digestive organs are not performing their functions as they do in health, and such articles they can not digest." Yet the same physician in the next breath will leave directions to give the same patient one, two, three or more hard, resinous, undigestible pills every hour perhaps, as if digestion had nothing to do in dissolving and appropriating these pills. In a healthy condition of digestion, it is a great convenience, even a blessing, to have medicines, disagreeable in taste or odor, covered by capsules or made into pill form, and these may be more pleasant by coating with sugar or gelatine. It is in a diseased condition that we are usually called upon to prescribe medicines. May we not in this way account for the many failures and disappointments we are reluctantly and even sorrowfully compelled to witness in our efforts to cure disease? We administer the remedies that science and the experience of our ablest authors assure us will arrest and cure the disorder, and yet the disease progresses the same as it would have done if we had not been relied on and our patient's dear life confidingly placed in our hands. In very considerable hæmorrhages, not only the solid constituents of the blood are withdrawn, but the serum also, leaving the blood greatly diminished in volume and quantity. Now, in order to supply this deficiency, the powers of absorption are forcibly called into requisition, and a rapid supply of fluid soon restores the blood to its former volume; and as the watery parts of the secretions are absorbed in greater proportions relatively than the more solid ingredients, there is but little fluid left to dissolve the solid medicines that may be administered at this particular time. May we not argue that the same condition applies to the system immediately succeeding one of those colliquative sweats that are so inseparably the result of a periodic chill? The capillaries being called upon to furnish a large amount of fluid during the profuse perspiration, the absorbents are again called into active requisition to supply the waste, and not enough fluid is left to dissolve solid medicines, while a fluid medicine would be greedily taken up during the activity of the absorbents.

How many of our veteran practitioners will be able, regretfully though it may be, to call to memory something like the following: A parent, around whom are entwined the fondest tendrils of heaven-created affection, suddenly stricken down with a malignant periodic disease which threatens to snatch from a loving embrace the partner of joys and sorrows, and the support of a dependent family. But the paroxysm is passed, the congestive stage of the disease subsides, and now comes the time for action, the time for the administration of antiperiodic remedies to prevent a recurrence of the dreaded chill. Even non-professional persons have learned the danger of a second or third recurring congestive chill; and the trusted family physician is called in and tearfully entreated to take the post of danger and save the loved one from the ruthless grasp of the much-feared approaching congestion. The skillful physician, fully aware of the power there is in antiperiodic remedies, in order "to make assurance doubly sure," prescribes a pill containing twice or three times as much as he would give in an ordinary case, and confidently relies on the increased quantity to prevent a return of the disease; but unfortunately the first attack had so deranged the secretions and destroyed the digestive powers that the pills remain undissolved in the stomach, and for this reason have pro-

duced no medicinal effect; the chill returns at the time it would have been expected had no medicine been given; the worse has come, the friends are in despair, the Doctor bows his head, defeated where victory was most desired, and amid the bitter tears and heart-rending shrieks of the bereaved ones, who appeal to him and say, "doctor, why could you not save him?" can only say I thought I had given enough medicine. I was disappointed. I am sorry. When we revert to that principle, where in order to be absorbed a medicine must be reduced to a liquid state, may we not infer that in the case just noticed, that if this medicine had been properly dissolved before administration, the result would have been quite different, and a useful life been spared to his friends. Since I commenced the preparation of this paper and brought the subject before medical men of my acquaintance, cases where persons had taken undigestible medicines and passed them through the alimentary canal or vomited them long after it was supposed they had been dissolved and the patient received the benefit of them, have come to me in rapid succession.

At the time of their passage they appeared to have elicited but little attention, and the only remedy proposed for this stupendous evil was to give more medicines of the same sort. So numerous have been the cases reported to me that to-day I do not know of a more prolific source from which to obtain information that would fill a large volume; and if the cases were collected where undigested medicines had passed off without being discovered, it would make a volume too large to be read in a life-time.

I shall content myself at this time by giving two representative cases, which came so nearly under my own observation that I can vouch for the authenticity of them.

On the 5th day of August, 1874, a very estimable lady of my acquaintance was attacked with a malarial chill and fever, accompanied by one of those profuse colliquative sweats, and although a lady of small stature, the perspiration not only saturated the clothing she had on and the bed clothing, but actually ran through the mattress. She immediately sent a messenger for the most prominent physician in the city to visit and prescribe for her.

He was a man "ripe in years and full of honors," having a larger practice than any other physician in the city, and enjoying the fullest confidence not only of the community but that of his fellow-practitioners also; a man who gave more hours to the study and practice of medicine than any one I ever saw; a thoroughly educated physician, who loved his profession and gave it his undivided time; an untiring student, he kept fully up with all the improvements in medical science, and was at the time professor of theory and practice in a medical college. His prescription was

℞—Quinia sulphatis, ℈ii;
Morph. sulphatis, grs. i;
Oil sasafras, gtts x;
Ft. Pill. No. xx; and the patient directed to take one pill every three hours.

The directions were followed during Wednesday, Thursday, Friday and Saturday, until the early part of the night, when she had another chill; she had taken in all forty-eight grains of quinia; the prescription having been renewed, she discontinued the remedy. On Sunday morning her stomach became nauseated; she vomited very hard and threw up twenty-four of the pills she had been taking through all these five days as whole and perfect as when swallowed. This combination of pills, it would appear, was not unusually insoluble, but the profuse perspiration had carried off so large a proportion of the fluids of the

body, and the absorbents being active in their efforts to supply the waste, not a sufficient amount of fluids was left in the stomach to dissolve the pills. A fluid medicine in this case would undoubtedly have been readily absorbed and half the amount been sufficient to arrest the intermittent. The patient in this case is still alive, but she is not indebted for that extension of life either to the doctor or the medicine, although both are entitled to the merit of good intentions. A few years ago I had a patient for whom I prescribed a favorite tonic and blood-making pill, composed of quinia, iron by hydrogen, arsenious acid and strychnia. One pill to be taken three times per day. The nurse who had charge of my patient was an exceedingly careful one and minutely inspected each evacuation. In one of these she discovered near a dozen spherical bodies resembling bullets. Not suspecting they were the pills my patient had been taking for four or five days, she washed them and put them away to show to me on my next visit. On examination they proved to be the identical pills I had so much relied on to enrich my patient's impoverished blood and improve his general health.

Then I discovered that all this time, by the digestive fluids failing to dissolve the pills, my patient had been deprived of the benefit to be derived from a needed medicine. Had I prescribed, instead of the pills, the elixir of the phosphate of iron, quinia and strychnia, and added the arsenic in solution, no such failure would have occurred.

Besides all this, he had been taking two remedies which in larger doses would have been poisonous. We will suppose that those pills had remained in the stomach or intestines until they had accumulated to the number that were voided at one time, and by some process a sufficient amount of solvent fluid had been secreted or come in contact with that number of pills and dissolved them at once, the patient would have been poisoned, and the natural inference would have been that the twentieth of a grain of arsenic and the same amount of strychnia had poisoned him, and thereby the false premises established that it was unsafe to administer these valuable remedies in doses of that size. Admitting the well-established fact that all medicinal substances, in order to be absorbed and produce their characteristic effects, must first be reduced to a fluid state, would we not be much more certain to secure the good effects of our remedies if they were reduced to a state of solution before being administered? The process of digestion and the reducing of solid or semi-fluid substances to solution, unquestionably pertains to a healthy state of these functions, and we are fully aware that in a state of disease food is not digested as it is when the digestive powers are performing their natural and healthy functions; may we not argue "a priori" that the same failure pertains to the digestion and appropriation of medicines in a state of disease; that notwithstanding we may give the proper medicine and at the right time, but give it in a form that we must necessarily depend upon the digestive fluids to dissolve it, and they fail to perform this office, our patients are not benefited, and valuable time, time which perhaps decides the fate of a human life, is lost.

In this enlightened, advanced and progressive age in which we live, the sciences of chemistry and pharmacy, although they have not accomplished all that we could desire, have made commendable and enterprising developments in the direction of condensing and combining medical materials into eligible forms for convenient administration; and to-day they are well up with the advance made by other sciences. Through their industry and enterprise, directed

by educated and scientific research, we now have nearly all the leading medicines in a concentrated form, easy of solution or already dissolved in the forms of elixirs and fluid extracts. Unqualified praise should be awarded to the educated pharmacists that those medicines can now be made of uniform strength and so concentrated that a small amount is required for a dose. Even solid substances, as iron and bismuth, and an almost innumerable number of vegetable substances, have been reduced to a uniform and agreeable state of solution, and being contained in hermetically sealed glass bottles and excluded from the light, are not liable to undergo change. It is impossible to attach too much importance to securing the entire solution of medicines administered, and for the purpose of calling attention prominently to this great desideratum in Practice, this article is offered for the careful consideration of the Profession.

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